SAMSUNG SECRET

SAMSUNG
ELECTRONICS

Product Information

Customer : GA   DATE : 05. Jan. 2011

SAMSUNG TFT-LCD

MODEL : **LTA320HN02**

The Information Described in this Specification is Preliminary and can be changed without prior notice

00121266

LCD Business

Samsung Electronics Co . , LTD.

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Revision History

Date	Rev. No	Page	Summary
05. Jan. 2011	000	all	First issued

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General Description

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Description

LTA320HN02 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit.

The resolution of a 32.0" is 1920 x 1080 and this model can display up to 16.7 Million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

Features

- RoHS compliance (Pb-free)
- High contrast ratio & aperture ratio with wide color gamut
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle (± 178°)
- High speed response
- FHD resolution (16:9)
- Low Power consumption
- Edge Type LED (Light Emitted Diode) BLU
- DE (Data Enable) mode
- 2ch LVDS (Low Voltage Differential Signaling) interface (2pixel/clock)

General Information

Items	Specification	Unit	Note
Module Size	$1036.08(H_{TYP})$ x 591.30 (V_{TYP})	mm	± 1.0mm
	10.8 (Max.)		
Weight	6.0 (Typ.)	Kg	+1.0Kg(Max)
Pixel Pitch	0.36375(V) x 0.12125(H)	mm	
Active Display Area	1018.08(H) x 572.67(V)	mm	
Surface Treatment	Anti-glare	-	
Display Colors	8bit – 16.7M	Colors	
Number of Pixels	1920 x 1080	Pixel	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Normally Black	-	
Luminance of White	400 (Typ.)	cd/m^2	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item		Symbol	Min.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	GND-0.3	13	V	(1)
Storage temperature		T_{STG}	-20	60	℃	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	℃	(2),(5)
	T. Uniformity	$\triangle T$	-	10	℃	
Shock (non - operating)		S_{nop}	-	50	G	(3)
Vibration (non - operating)		V_{nop}	-	1.5	G	(4)

Note (1) Ta= 25 ± 2 ℃
    (2) Temperature and relative humidity range are shown in the figure below.
        a. 90 % RH Max. (Ta ≤ 39 ℃)
        b. Relative Humidity is 90% or less. (Ta > 39 ℃)
        c. No condensation
    (3) 11ms, sine wave, one time for ± X, ± Y, ± Z axis
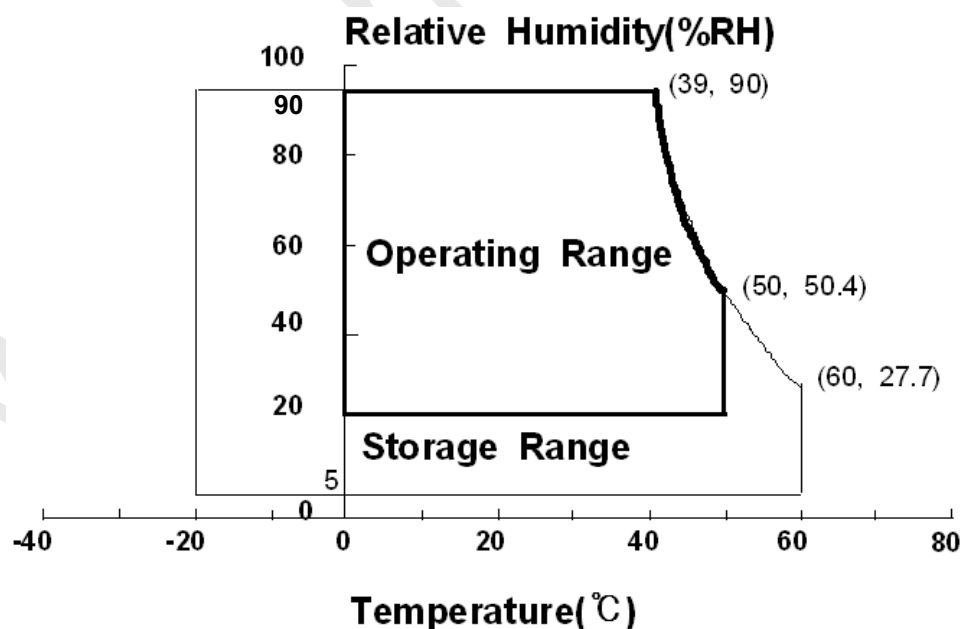   (4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

Fig. Temperature and Relative humidity range

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(5) Definition of test point

5mm

5mm

LCD Module (Active)
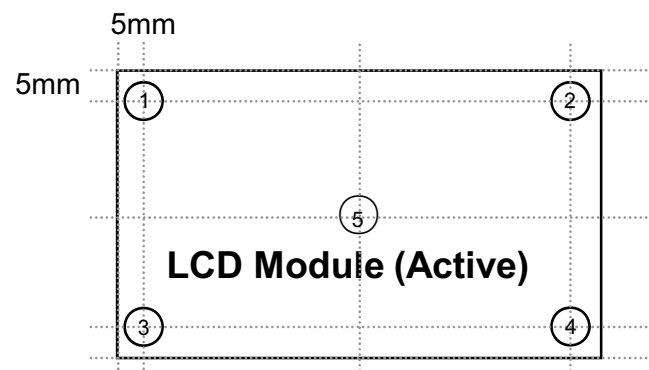
$\triangle$T should be less than *10* $℃$ ($\triangle$T = | T_{OPR} – T_{MAX}|)

T_{OPR} : Temperature of the center of the glass surface (Test point 5)
T1~ T4 : Temperature of each edge of the glass surface
T_{MAX} : The highest temperature of the glass surface

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2. Optical Characteristics

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The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ,ELDIM EZ-Contrast

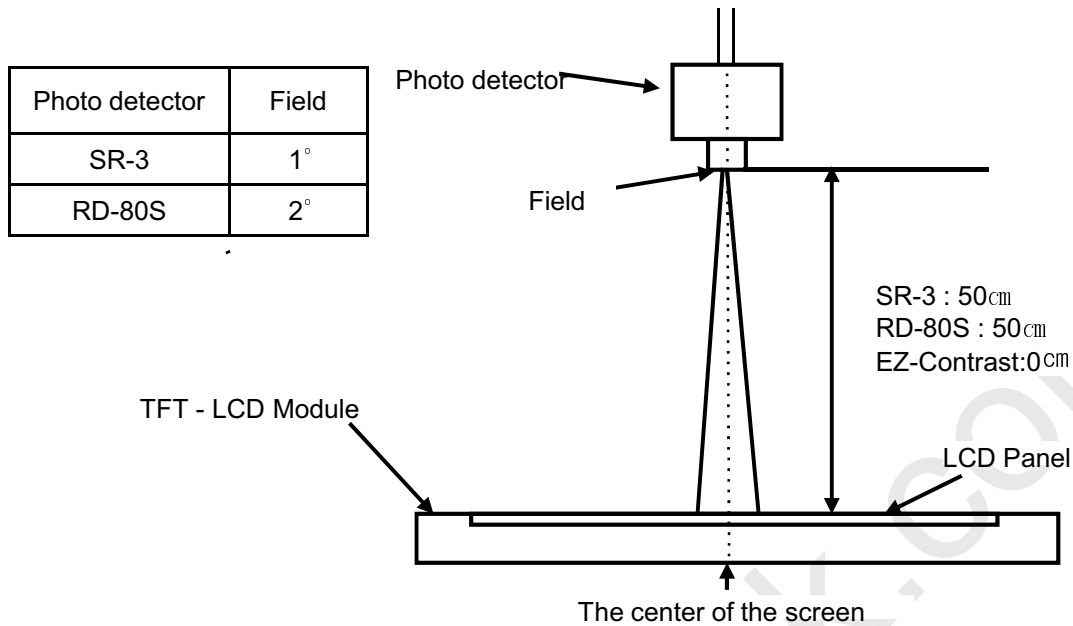(Ta = 25 $\pm$ 2℃, VDD=12.0V, fv=60Hz, f_{DCLK}=148.5MHz, LED Current = 140 mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R	Normal θ**L,R**=0 θ**U,D**=0 Viewing Angle	4,000	5,000	-		(1) SR-3
Response Time	G-to-G	Tg		-	8	-	msec	(3) RD-80S
Luminance of White (Center of screen)		Y_L		350	400	-	cd/m^2	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.637	TYP. +0.03		(5),(6) SR-3
		Ry			0.331			
	Green	Gx			0.284			
		Gy			0.607			
	Blue	Bx			0.148			
		By			0.057			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	69	-	%	(5) SR-3
Color Temperature		-		-	10,000	-	K	
Viewing Angle	Hor.	$θ_L$	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		$θ_R$		75	89	-		
	Ver.	$θ_U$		75	89	-		
		$θ_D$		75	89	-		
Brightness Uniformity (9 Points)		B_{uni}		-	-	25	%	(2) SR-3

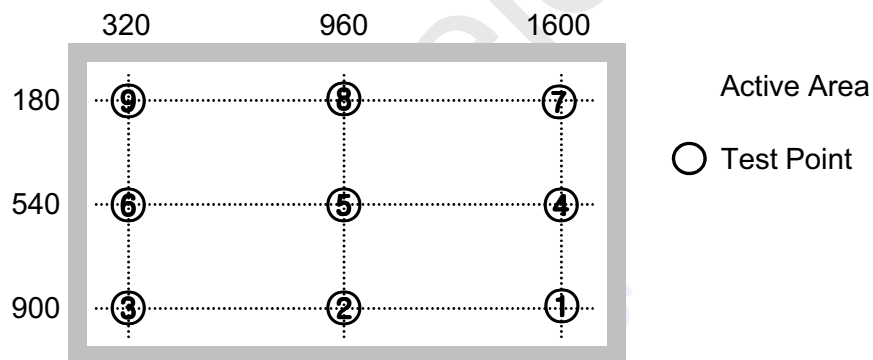- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between
40min and 60min after lighting the back light at the given temperature for stabilization
of the back light. This should be measured in the center of screen.

Environment condition : Ta = 25 $\pm$ 2 ℃

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Photo detector	Field
SR-3	1°
RD-80S	2°

Photo detector

Field

SR-3 : 50㎝
RD-80S : 50㎝
EZ-Contrast:0㎝

TFT - LCD Module

LCD Panel

The center of the screen

- Definition of test point

Active Area

○ Test Point

Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G\max}{G\min}$$

Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

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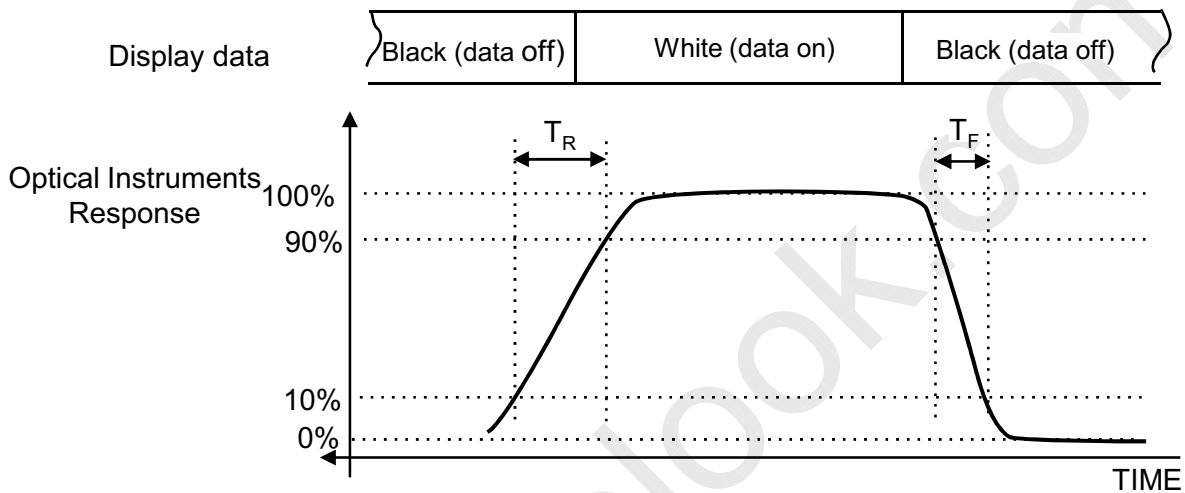
Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

Note (3) Definition of Response time : Sum of Tr, Tf

| Display data | Black (data off) | White (data on) | Black (data off) |

Optical Instruments Response — 100%, 90%, 10%, 0% vs TIME, showing T_R and T_F

※ G- to- G : Average response time between Gray to Gray (Scale)
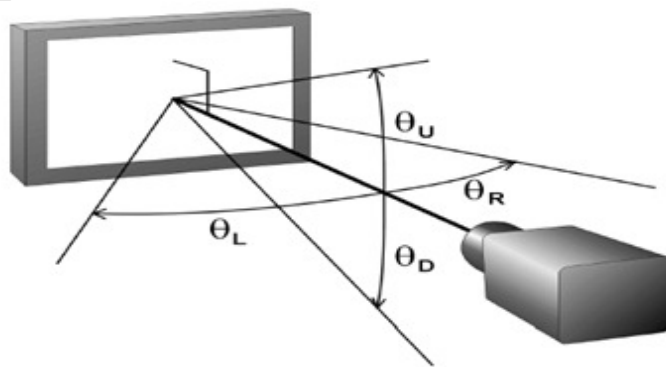
Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)
    Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle
    : Viewing angle range (C/R ≥10)

Θ_U, Θ_R, Θ_L, Θ_D

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3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

Ta = 25℃ ± 2 ℃

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I_{DD}	-	500	-	mA	(2),(3)
	(b) White		-	700	-	mA	
	(c) N-pattern		-	800	-	mA	
Vsync Frequency		f_V	-	60	-	Hz	
Hsync Frequency		f_H	-	67.5	-	kHz	
Main Frequency		Fdclk	-	148.5	-	MHz	
Rush Current		I_{RUSH}	-	-	TBD	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}.

(2) f_V=60Hz, f_{DCLK} =148.5MHz, V_{DD} = 12.0V, DC Current.

(3) Power dissipation check pattern (LCD Module only)
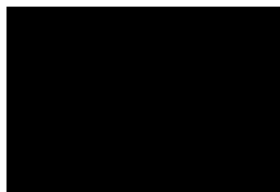
a) Black Pattern　　　b) White Pattern　　　c) N-Pattern
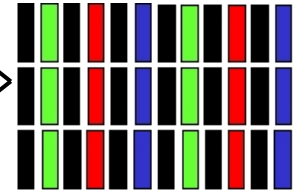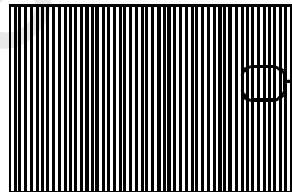
(4) Measurement Conditions

T_{RUSH}=470μs
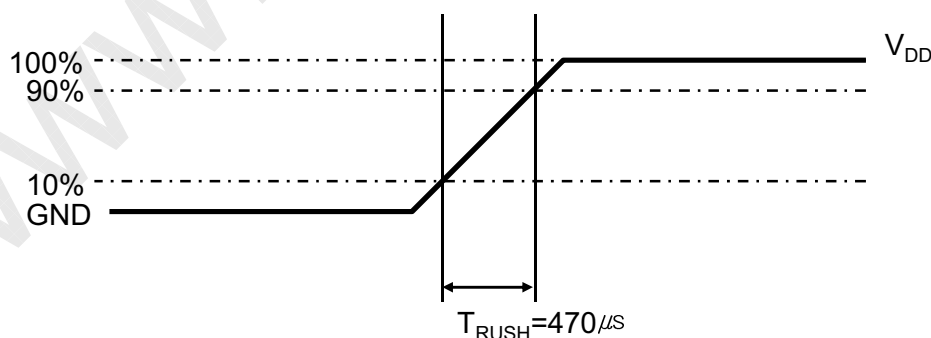
Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470μs.

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3.2 Back Light Unit

The back light unit contains Edge type White LEDs (Light Emitting Diode)

Ta=25 ± 2℃
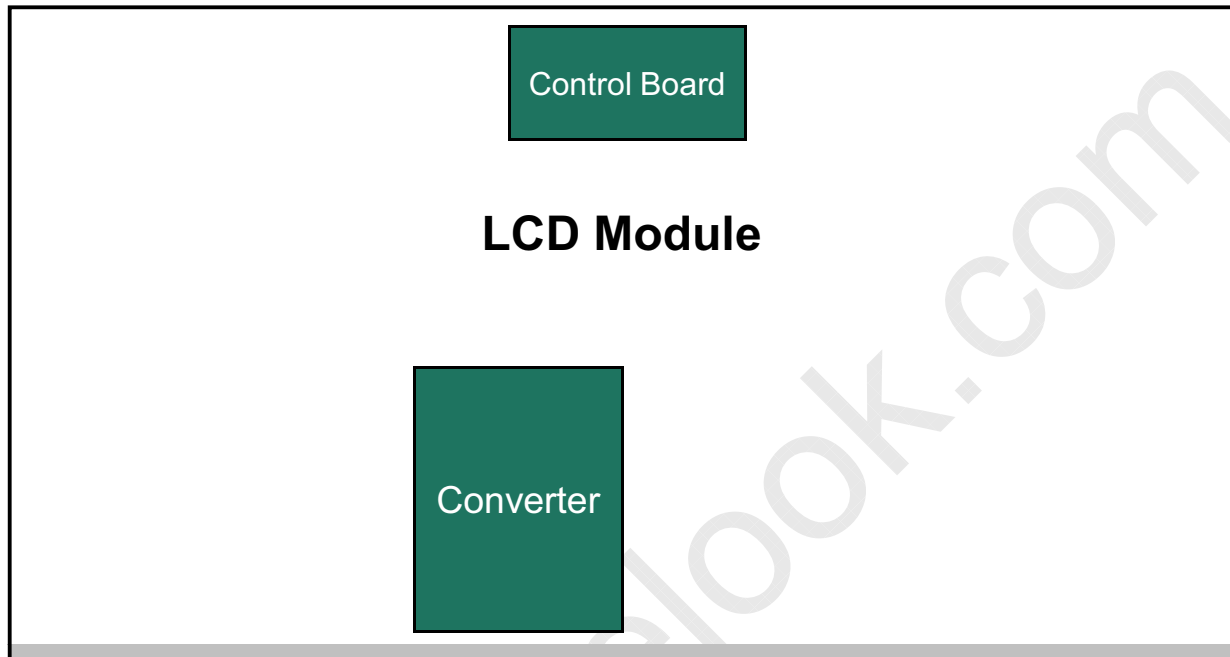
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	30,000	-	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original

value.

[Operating condition : Ta = 25± 2℃, For single lamp only.]

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3.3 Converter Input Condition & Specification

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Items	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Input Voltage	Vin	-	22	24	26	V	Ta=25± 2 ℃
Input Current	I_{RUSH}	Vin=24.0V Vdim =3.3V	-	-	TBD	A	
Output Current	$I_{O,MAX}$	Vin = 24.0V V dim =3.3 V	TBD	TBD	TBD	mArms	
Shut down Time	Tsd	Vin=22.0 ~26.0V V dim: 0~3.3V	-	-	TBD	msec	
Backlight On/Off	ON	Vin=24.0 V	TBD	-	TBD	V	
	OFF	Vin=24.0 V	TBD	-	TBD		
Dimming Range	V_{DIM}	Vin :22~26V	TBD	-	TBD	V	
Dimming Duty Output	D max	Vin=24V Dim:3.3V	TBD	-	-	%	(2)
	D min	Vin=24V Dim:0V	-	TBD	-		
Dimming Frequency	F_{PWM}	Vin=24.0 V	-	TBD	-	Hz	
External Dimming Duty Range	EX_Dim	Min	TBD	-	TBD	%	(2)
External Dimming Frequency Range	F_{EX_PWM}	Vin=22.0~26.0 V	TBD	-	TBD	Hz	Dim Pin(#13) : Floating
External Dimming Signal Level	V_{PWM}	High (ON)	TBD	-	TBD	V	
		Low (Off)	TBD	-	TBD		

Note) Power Consumption is measured when 430 [cd/m] of luminance which is the typical luminance.

(1) All data is measured after 120min warm-up.

- Additional Appendix for Supply Current & Power consumption

Items	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Current	Iin _ overshoot	Vin = 24V, Dim=3.3V (Within 1hr at BLU on)	-	TBD	TBD	A
	Iin _ saturation	Vin = 24V, Dim=3.3V (After 1hr Aging)	-	TBD	TBD	A
Power Consumption (Back light)	P _ Inrush	Vin=24.0V, Vdim = 3.3V	-	-	TBD	Watt
	P _ overshoot	Vin = 24V, Dim=3.3V (Within 1hr at BLU on)	-	TBD	TBD	Watt
	P _ saturation	Vin = 24V, Dim=3.3V (After 1hr Aging)	-	TBD	TBD	Watt

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4. Input Terminal Pin Assignment   *SAMSUNG SECRET*

4.1. Input Signal & Power   Connector : FI-RE51S-HF (JAE)

Pin	Symbol	Description	Pin	Symbol	Description
1	12V	DC power supply	26	RE[0]P	Even LVDS Signal +
2	12V	DC power supply	27	RE[1]N	Even LVDS Signal -
3	12V	DC power supply	28	RE[1]P	Even LVDS Signal +
4	12V	DC power supply	29	RE[2]N	Even LVDS Signal -
5	12V	DC power supply	30	RE[2]P	Even LVDS Signal +
6	NC	NOTE1	31	GND	Ground
7	GND	Ground	32	ROCLK-	Even LVDS Clock -
8	GND	Ground	33	ROCLK+	Even LVDS Clock +
9	GND	Ground	34	GND	Ground
10	RO[0]N	Odd LVDS Signal -	35	RE[3]N	Even LVDS Signal -
11	RO[0]P	Odd LVDS Signal +	36	RE[3]P	Even LVDS Signal +
12	RO[1]N	Odd LVDS Signal -	37	NC	NOTE1
13	RO[1]P	Odd LVDS Signal +	38	NC	
14	RO[2]N	Odd LVDS Signal -	39	GND	Ground
15	RO[2]P	Odd LVDS Signal +	40	NC	
16	GND	Ground	41	NC	
17	ROCLK-	Odd LVDS Clock -	42	NC	
18	ROCLK+	Odd LVDS Clock +	43	NC	
19	GND	Ground	44	NC	
20	RO[3]N	Odd LVDS Signal -	45	NC	NOTE1
21	RO[3]P	Odd LVDS Signal +	46	NC	
22	NC	NOTE1	47	NC	
23	NC		48	NC	
24	GND	Ground	49	NC	
25	RE[0]N	Even LVDS Signal -	50	NC	
			51	NC	NOTE1

Note1) No Connection: These PINS are used only for SAMSUNG. (DO NOT CONNECT)

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Note(3) Pin number starts from Left side

PCB

Pin No. 1   Pin No. 51

#1   #51

#1   #51

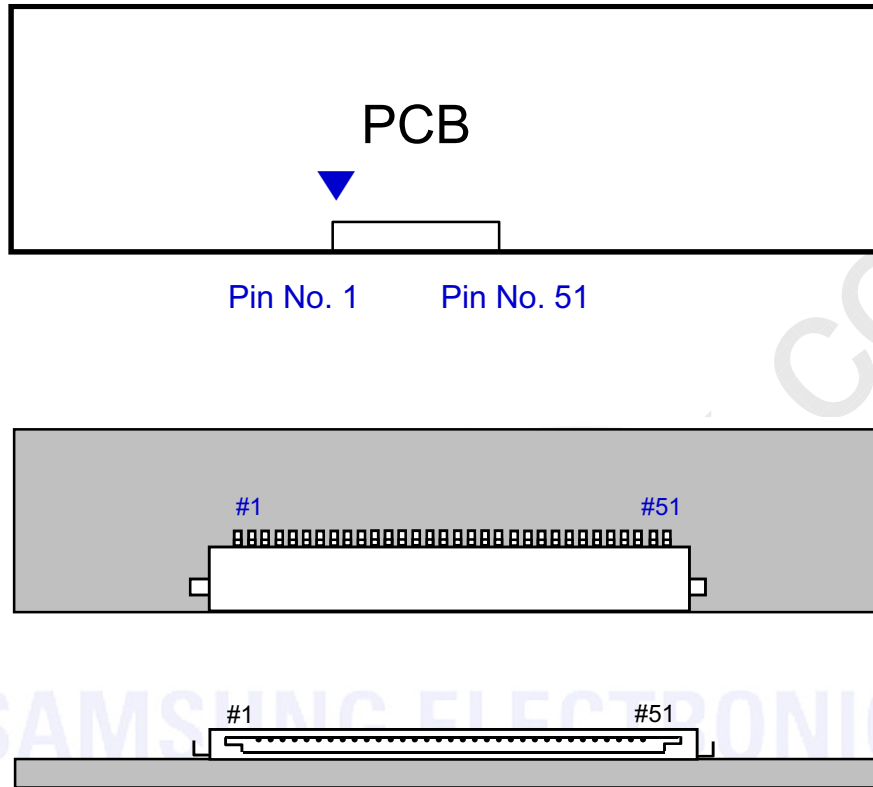**Fig. Connector diagram**

a. Power GND pins should be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pin should be separated from other signal or power.

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4.2 Converter Input Pin Configuration

Connector : Yeon-ho, 20022WR-14B1

Pin No.	Pin Configuration(FUNCTION)
	Master
1	24 V
2	24 V
3	24 V
4	24 V
5	24 V
6	GND
7	GND
8	GND
9	GND
10	GND
11	Error Out
12	Backlight On /Off [ON:2.4 – 5.5 V, OFF: 0 - 0.8 V]
13	Dimming Control [0V:Min, 3.3V:Max] *Note(1)
14	External PWM [0~100%] *Note(1)

Note(1) If use Dimming Control, Pin 14 Must be N.C
        If use External PWM, Pin 13 Must be N.C

4.3. Converter Input Power Sequence

Vin (24V)   0.9 Vin   0.02sec [Min]   0.1 Vin   0.9 Vin

Dimming Control (0 ~ 3.3 V)

0.5sec [Min]   0.2sec [Min]

2.4V(On level)   0.8V(Off level)

Backlight On/Off

0sec [Min]   0 sec [Min]
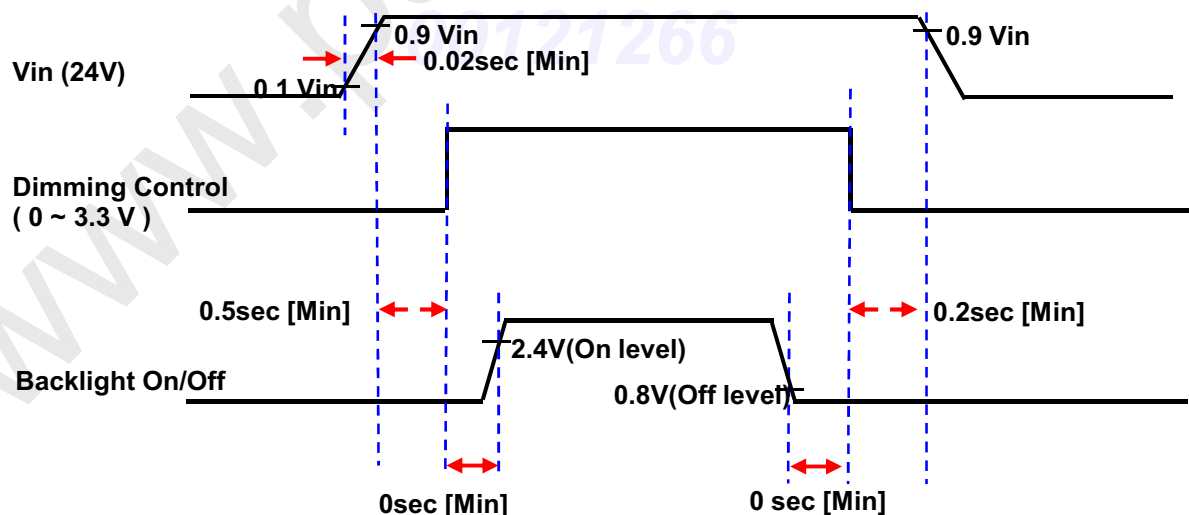
Note) SEQUENCE : ON = Vin(24V) > Dimming Control ≥ Backlight On/Off
                OFF = Backlight On/Off ≥ Dimming Control > Vin(24V)

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4.4 LVDS Interface
- LVDS Receiver : T-con (merged)
- Data Format (JEIDA Only)

	LVDS pin	JEIDA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R2
	TxIN/RxOUT1	R3
	TxIN/RxOUT2	R4
	TxIN/RxOUT3	R5
	TxIN/RxOUT4	R6
	TxIN/RxOUT6	R7
	TxIN/RxOUT7	G2
TxOUT/RxIN1	TxIN/RxOUT8	G3
	TxIN/RxOUT9	G4
	TxIN/RxOUT12	G5
	TxIN/RxOUT13	G6
	TxIN/RxOUT14	G7
	TxIN/RxOUT15	B2
	TxIN/RxOUT18	B3
TxOUT/RxIN2	TxIN/RxOUT19	B4
	TxIN/RxOUT20	B5
	TxIN/RxOUT21	B6
	TxIN/RxOUT22	B7
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R0
	TxIN/RxOUT5	R1
	TxIN/RxOUT10	G0
	TxIN/RxOUT11	G1
	TxIN/RxOUT16	B0
	TxIN/RxOUT17	B1
	TxIN/RxOUT23	RESERVED

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4.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑ ↓ LIGHT	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R252
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑ ↓ LIGHT	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G252
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑ ↓ LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:		:	:	:	:	:	:		:	:	:	:	:	:	:		B3~ B252
		:	:	:	:	:	:		:	:	:	:	:	:		:	:	:	:	:	:	:		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B255

Note) Definition of Gray :
Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)
Input Signal : 0 = Low level voltage, 1 = High level voltage

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5. Interface Timing

5.1 Timing Parameters （DE only mode）

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	TBD	148.5	TBD	MHz	-
Hsync		F_H	TBD	67.5	TBD	KHz	-
Vsync		F_V	TBD	60.0	TBD	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	TBD	1125	TBD	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	TBD	2200	TBD	clocks	-

Note) This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.
(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
(2) Internal V_{DD} = 3.3V
(3) Spread spectrum
- Modulation rate (max) : ± TBD %
- Modulation Frequency : under TBDKHz

5.2 LVDS Input Data Characteristics

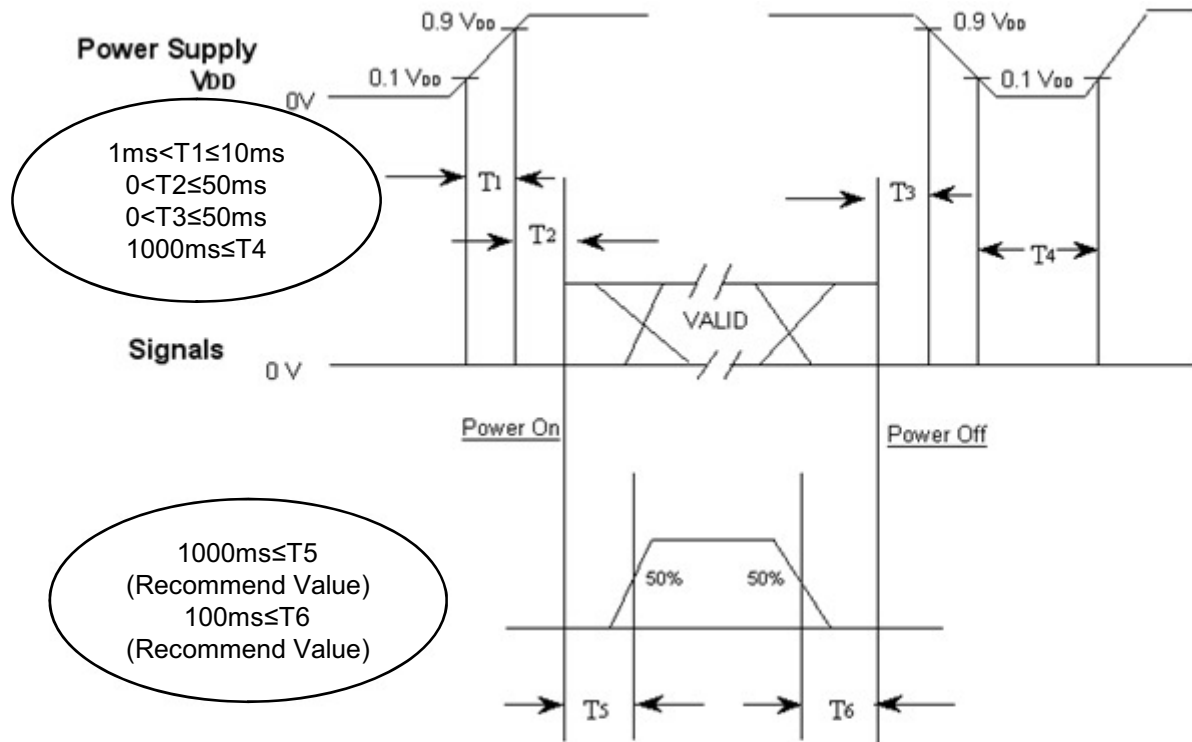| ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Input Data Position	F_{IN}=80MHz	t_{RSRM}	-	-	TBD	ps	
		t_{RSLM}	TBD	-	-	ps	
Input common mode voltage		V_{CM}	TBD	-	TBD	V	-
Differential Input Voltage		$|V_{ID}|$	TBD	-	TBD	mV	-

Note) When the skew is measured the Spread Spectrum should be 0%

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5.3 Timing diagrams of interface signal (DE only mode)

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5.4 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.

1ms<T1≤10ms
0<T2≤50ms
0<T3≤50ms
1000ms≤T4

1000ms≤T5
(Recommend Value)
100ms≤T6
(Recommend Value)

T1 : V_{DD} rising time from 10% to 90%
T2 : The time from V_{DD} to valid data at power ON.
T3 : The time from valid data off to V_{DD} off at power Off.
T4 : V_{DD} off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

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T

B

00121266

D

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T

B

D

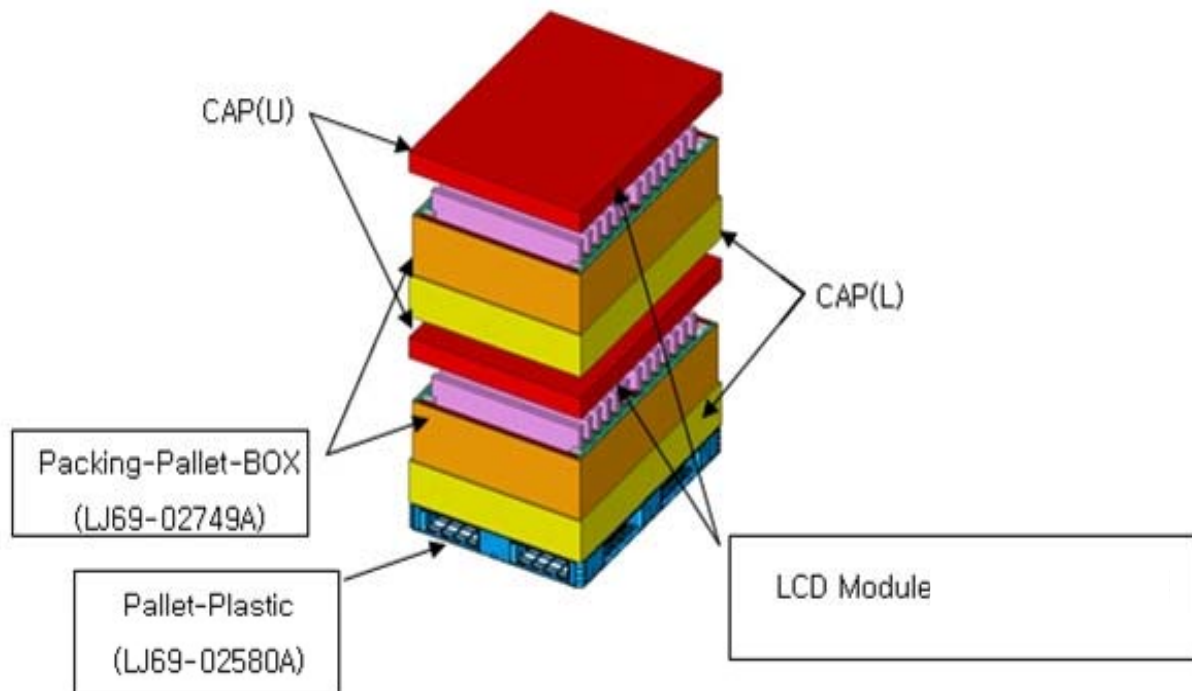| MODEL	LTA320HN02	Doc. No	06-000-G-20110105	Page	22 / 27

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7. PACKING

7.1 CARTON (Internal Package)
 (1) Packing Form
　　Corrugated fiberboard box and corrugated cardboard as shock absorber
 (2) Packing Method

7.2 Packing Specification

Item	Specification	Remark
LCD Packing	24ea / Box	1. 2.00 Kg / LCD (10[ea]/Tray, 150[ea]/Pallet) 2. 0.04 Kg / Middle sheet (16[ea]/Tray, 160[ea]/Pallet) 2. 5.52 Kg / Panel tray (30ea/Pallet) 3. 2.00 Kg / Packing-Upper Box (1ea)
Pallet-Plastic	1Box / Pallet (W1200,L850,H120, YELLOW)	1. Pallet weight = 23 kg 2. 23 Kg / Pallet
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1475mm(H) x 1150mm(V) x 1131mm(height)
Total Pallet Weight	294 kg	Pallet(23kg) + Panel tray(165.6kg) + Panel(280kg) + Middle sheet(7.9Kg) + Packing-Upper Box (2.0kg)

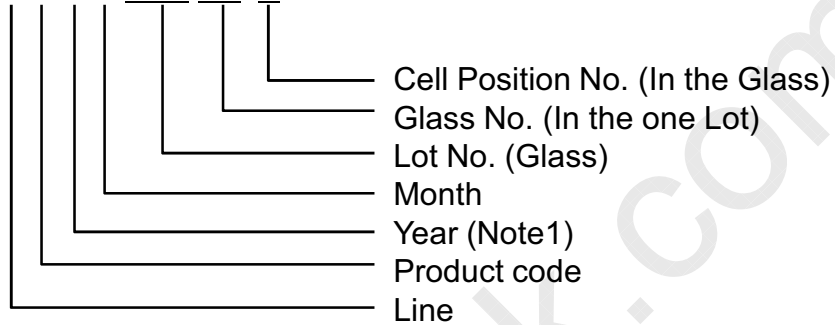| MODEL	LTA320HN02	Doc. No	06-000-G-20110105	Page	23 / 27

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8. MARKING & OTHERS

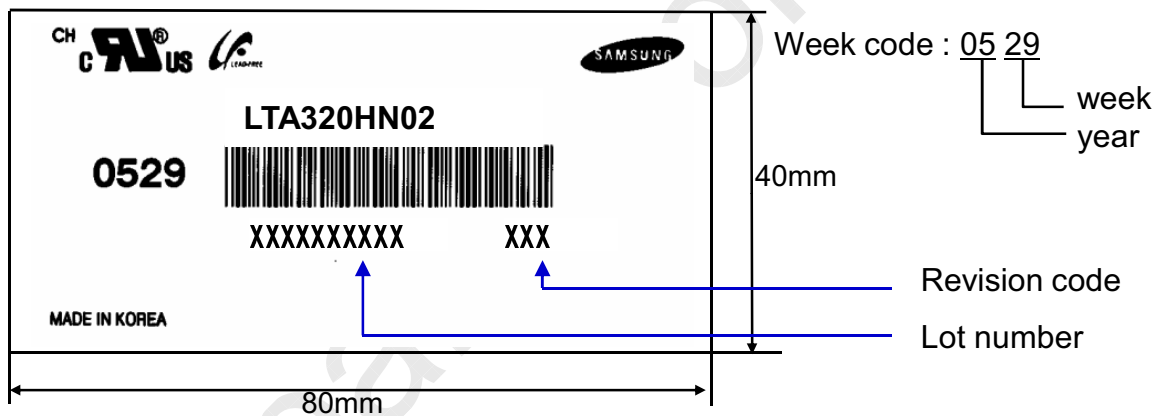A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

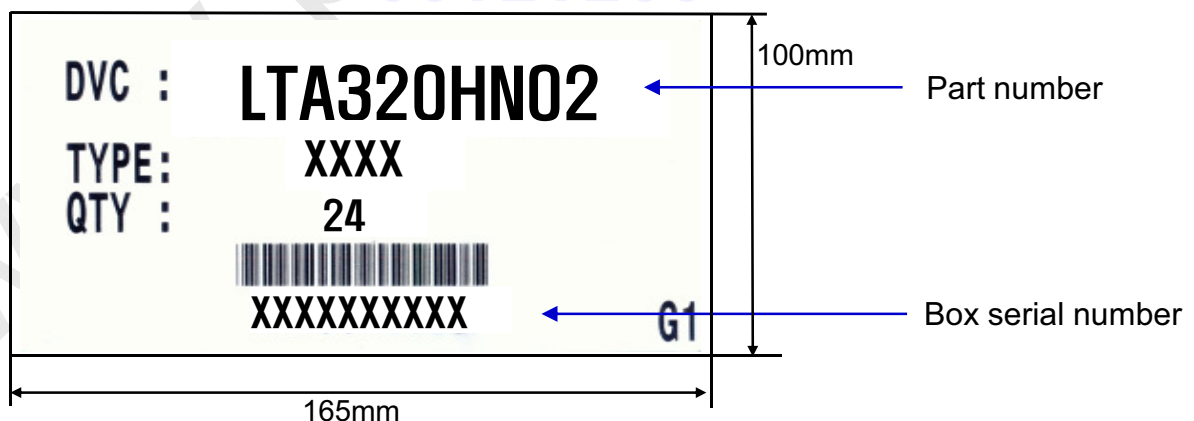(1) Part number : LTA320HN02
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X

- Cell Position No. (In the Glass)
- Glass No. (In the one Lot)
- Lot No. (Glass)
- Month
- Year (Note1)
- Product code
- Line

(4) Nameplate Indication

LTA320HN02
0529
XXXXXXXXXX   XXX
MADE IN KOREA
40mm
80mm

Week code : 05 29
- week
- year

Revision code
Lot number

(5) Packing box attach

DVC : LTA320HN02
TYPE: XXXX
QTY : 24
XXXXXXXXXX   G1
100mm
165mm

Part number
Box serial number

00121266

(6) Others
  1. After service part
     Lamps cannot be replaced because of the narrow bezel structure.

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9. General Precautions

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9.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.

(c) Refrain from strong mechanical shock and / or any force to the Module. In addition to damage, this may cause improper operation or damage to the Module and CCFL back light.

(d) Note that polarizers are very fragile and could be damage easily. Do not press or scratch the surface harder than a HB pencil lead.

(e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.

(f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(g) Desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.

(i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or Semiconductor would be damaged.

(j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(k) Do not disassemble the Module.

(l) Do not disassemble shield case of inverter & LVDS board.

(m) Do not connect N.C pins. (Samsung internal use only)

(n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handle a module

(o) Pins of I/F connector should not be touched directly with bare hands.

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9.2 Storage

(a) Do not leave the Module in high temperature, and high humidity for a long time.
It is highly recommended to store the Module with temperature from 0 to 35℃
and relative humidity of less than 70%.

(b) Do not store the TFT-LCD Module in direct sunlight.

(c) The Module should be stored in a dark place. It is prohibited to apply sunlight or
fluorescent light in storing.

9.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic
interference should be done by system manufacturers. Grounding and shielding methods
may be important to minimize the interference.

(d) The cable between the back light connector and its inverter power supply should
be connected directly with a minimized length. A longer cable between
the back light and the inverter may cause lower luminance of lamp (CCFT) and
may require higher startup voltage (Vs).

9.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
- Temperature : 20± 15℃
- Humidity : 55± 20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature,
humidity, display patterns or operation time etc.., It is strongly recommended
to contact SEC for Application engineering advice. Otherwise, its reliability and
function may not be guaranteed. Extreme conditions are commonly found at
Airports, Transit Stations, Banks, Stock market, and Controlling systems.

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9.5 Others　　　　　　　　　　　　　　　　　　　　*SAMSUNG SECRET*

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked " to the screen.
To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.

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